ABSTRACT OF DISCLOSURE

Methods of and systems for illuminating objects using planar laser illumination beams having substantially-planar spatial distribution characteristics that extend through the field of view (FOV) of image formation and detection modules employed in such systems. Each planar laser illumination beam is produced from a planar laser illumination beam array (PLIA) comprising an plurality of planar laser illumination modules (PLIMs). Each PLIM comprises a visible laser diode (VLD, a focusing lens, and a cylindrical optical element arranged therewith. The individual planar laser illumination beam components produced from each PLIM are optically combined to produce a composite substantially planar laser illumination beam having substantially uniform power density characteristics over the entire spatial extend thereof and thus the working range of the system. Preferably, each planar laser illumination beam component is focused so that the minimum beam width thereof occurs at a point or plane which is the farthest or maximum object distance at which the system is designed to acquire images, thereby compensating for decreases in the power density of the incident planar laser illumination beam due to the fact that the width of the planar laser illumination beam increases in length for increasing object distances away from the imaging optics. Advanced high-resolution wavefront control methods and devices are disclosed for use with the PLIIM-based systems in order to reduce the power of speckle-noise patterns observed at the image detections thereof. By virtue of the present invention, it is now possible to use both VLDs and high-speed CCD-type image detectors in conveyor, hand-held and hold-under type imaging applications alike, enjoying the advantages and benefits that each such technology has to offer, while avoiding the shortcomings and drawbacks hitherto associated therewith.